Market and Technology Assessment

U.S. Department of Energy Workshop on Standards for Distribution Transformers

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Market and Technology Assessment Provides Data in Support of the Standards Setting Process

- **Develop a detailed understanding of the**
  - **Design**
  - **Manufacture**
  - **Distribution**
  - **Application**

    of distribution transformers
- **Provide background information for future analyses**

The Market and Technology Assessment Provides Input To:

- **Screening analysis**
- **Engineering analysis**
- **Life-cycle cost analysis**
- **National energy savings**
- **Manufacturer impact analysis**
- **Utility impacts analysis**
- **Net national employment impacts**

We Have Three Issues of Special Concern Related to the M&TA

- **Identification of *Product Classes***
- **Selection of *Baseline Models***
- ***Determination of cost–price relationship***

The Types and Uses of Distribution Transformers May Require Defining Several *Product Classes*

- **Distribution transformers may be separated into product classes if capacity or other performance-related features inherently affect efficiency and warrant a separate standard**
- **Because product features may affect the cost vs. efficiency relationship, separate efficiency standards will be considered for product classes**

The Department Desires to Use the Fewest Product Classes Possible

- **NEMA TP1 uses 73 product classifications**

- **Each product class requires separate analysis**

Several Distribution Transformer Product Classifications Are in Use

- **Capacity (kVA)**
- **Insulation system (liquid vs. dry)**
- **Number of phases (single vs. three)**
- **Voltage level (low vs. medium)**
- **Temperature-rise categories**
- **Pole-mount vs. pad-mount**
- **Encapsulated vs. ventilated**
- **Harmonics (K-factor) types**

Transformer Usage May Also Give Rise to Product Classifications

- **Different types or capacities may be loaded differently, e.g.:**
  - **Large vs. small capacity**
  - **Three-phase units usually serve motor loads**
- **Outdoor applications and high primary voltages require higher insulation levels**
- **Harsh environments…**
- **Other?**

There Are Many Questions That Relate to Product Class

- **Should encapsulated and ventilated be required to meet the same efficiency levels?**
- **In what applications are liquid- and dry-type transformers interchangeable?**
- **Should medium voltage transformers be divided into two or more classes by primary voltage?**
- **Under what conditions can scaling rules such as the 0.75 power rule for losses, costs, etc. be applied?**
- **Should pad-mount and pole-mount transformers meet the same efficiency standards?**
- **Do "K-factor" transformers warrant a product class of their own?**
- **Do differences in loading of large and small transformers affect whether product classes should be created based on capacity?**
- **How much does high BIL increase transformer losses?**

Decisions on Product Class Have a Specific Logic

- **Does a transformer characteristic or feature inherently affect efficiency?**
- **What utility does the feature provide?**
- **Why is the feature valuable or important?**
- **Can a scaling or correction factor be used to adjust efficiency for the presence of the feature?**

A Baseline Model Is Needed for Each Product Class

- **The baseline is the model against which efficiency levels will be compared**
- **The baseline model is a typical, low efficiency model in the marketplace**
- **The baseline model is used as a point of comparison in the life-cycle cost and payback analyses — benefits and costs are estimated by comparison with the baseline model**

The Department Seeks Comment on the Baseline Models

- **For low-voltage transformers, 150-degree rise units may be the baseline models**
- **For medium-voltage transformers, low-cost (i,.e., unevaluated) models may be used**

Are there better choices?

Prices, Costs, and Markups are Used in Several Analyses

- **The engineering analysis examines the costs of improved transformer efficiency**
- **The price-cost relationship relates the costs of efficiency improvements to price paid by owner**
- **Transformer price is used in the life-cycle cost and national impacts analyses**
- **Transformer cost and price is used in the manufacturer impacts analyses**

Neither Price nor Markup Are Clear for Distribution Transformers

- **The actual transformer price paid is often much less than catalog price**
- **Distributor markups affect price**
- **The contractor who installs a transformer may add a markup**
- **The price of the transformer may be bundled with other parts of the electrical system**

The Department May Use Several Approaches to Determine Markups

- **For commodity-like transformers we anticipate contacting distributors**
- **For utility transformers we anticipate relying on information from manufacturers**
- **For other non-utility transformers we anticipate collecting information from manufacturers, distributors, and electrical contractors/designers/consultants**

The Department Seeks Comments on Transformer Markup

- **Suggestions on how to collect markup information**
- **Manufacturers, distributors, contactors, utilities who can provide markup information**
- **Other approaches to collect price and cost information**